CLAIMS

1. Method for identifying a specific image (11) and/or a specific audiovisual sequence (2) within any said flow (3) of said images (6) or said audiovisual sequences (7), and in particular with the prospect of being able to identify a proprietary image (4) within the flow (3) and/or of being able to identify, preferably in real time, a plurality of said proprietary audiovisual sequences (5) within the flow (3);

the method comprising the step of calculating, for each said image (6), an index appearing in the form of a ordered and finite set (21) of values, and in particular in the form of a characteristic vector (9), encoding the content of the image (6); the index calculation process being hereinafter called the indexing process (39);

the method comprising:

the step of calculating a reference index (10), using the indexing process (39) for the specific image (11), or

the step of extracting said reference indexes (10) from the specific audiovisual sequence (2), so as to form a reference set (30) of said reference indexes (10);

in such a way that said reference indexes (10) characteristic of the specific image (11) and/or of the specific audiovisual sequence (2) are thus obtained;

the method additionally comprising the step of calculating an index for the current images (13) of the flow (3), using the indexing process (39) for the current images (13) of the flow (3); the index being hereinafter called the current index (14);

the method additionally comprising the step of comparing the reference indexes (10) with the current index (14) of the current image (13) of the monitored flow (3);

in such a way that the method makes it possible to detect a specific image (11) within a flow (3) with great precision and extremely fast, while being robust during major photometric alterations.

2. Method in accordance with claim 1; the method being such that, to calculate an index of a image (6), and in particular a reference index (10) and/or a current index (14), it comprises the step of resampling the image (6) as an image with fixed dimensions in advance; the resampled image being hereinafter called the normalized image (16);

the method additionally comprising, if the image (6) is a color image comprising levels of colors, the step of converting the levels of colors of the image (6) to be resampled to levels of gray beforehand;

the normalized image (16) being represented by a matrix (19) of said pixel values (17) after discrete quantization of the pixel values;

the method additionally comprising the following steps:

the step of arranging the values according to a predetermined running order of the positions (18) in the matrix (19), and in particular by concatenating the values of each line of the matrix (19) in the form of a characteristic vector (9), so as to obtain the index.

3. Method in accordance with claim 2; the method additionally comprising the step of calculating the discrete entropy of the distribution of the values of the reference index (10) or of the current index (14); the entropy being hereinafter called the reference marginal entropy (50a) or the current marginal entropy (50b);

in such a way that the comparison time is thus optimized;

in such a way that it is thus possible to add this marginal entropy value to the index.

4. Method in accordance with claim 3; the indexes appearing in the form of said ordered and finite sets (21a, 21b) of values identified, in the reference index (10) and the current index (14), by a system of coordinates (22);

the method being such that it additionally comprises the following steps:

the step of defining, for a given coordinate (24) of the system of coordinates (22), a pair of values (25, 26), of which:

- the first value (25) is the value appearing in the reference index (10) associated with the given coordinate (24), and of which

- the second value (26) is the value appearing in the current index (14) associated with the given coordinate (24),

the step of calculating the bidimensional histogram (27) of the pairs of values (25, 26) obtained for all the coordinates of the system of coordinates (22) of the reference index (10) and of the current index (14),

the step of calculating the discrete entropy of the bidimensional histogram, hereinafter called the entropy of the bidimensional histogram (28),

the step of calculating a comparison distance (29) between a reference index (10) and a current index (14), forming the ratio between the sum of the reference marginal entropy (50a) and of the current marginal entropy (50b) reduced by the entropy of the bidimensional histogram (28) as the numerator and the sum of the reference marginal entropy (50a) and of the current marginal entropy (50b) as the denominator.

5. Method in accordance with claim 4; the method being such that, to extract the reference indexes (10) of the specific audiovisual sequence (2) from the specific audiovisual sequence (2), it additionally comprises the following steps:

the step of initializing a reference set (30) containing the reference indexes (10) of the specific images (11) with the reference index (100) of the first specific image (110) of the specific audiovisual sequence (2); the reference index (100) of the first specific image (110) of the specific audiovisual sequence (2) constituting the first reference index of the reference set (30);

the method additionally comprising:

(a) the step of calculating, for each said specific image (11) of the specific audiovisual sequence (2), a temporary current index (31) and of calculating a

comparison distance (29) between the temporary current index (31) and the last reference index (32) added to the reference set (30),

(b) the step of comparing the comparison distance (29) between the temporary current index (31) and the last reference index (32) added to the reference set (30) to a predetermined threshold SE (33);

(c) the step of adding the temporary current index (31) to the reference set (30), if the comparison distance (29) exceeds the predetermined threshold SE (33); the temporary current index (31) becoming the last reference index (32) of the reference set (30);

the method additionally comprising the step of repeating the steps (a) through (c) up to the end of the specific audiovisual sequence (2).

6. Method in accordance with any of the claims 1 through 5; the method being such that, for comparing the reference indexes (10) with the current index (14) of the current image (13) of the monitored flow (3), it additionally comprises the step of comparing the comparison distance (29) to a predetermined threshold SF (65);

in such a way that in the case of any said flow (3) of said images (6) the specific image (11) is detected provided that the comparison distance (29) between the reference index (10) of the specific image (11) and the current index (14) is less than the predetermined threshold SF (65).

7. Method in accordance with claim 5; the method being more particularly designed for detecting a specific audiovisual sequence (2) within any said flow (3) of said audiovisual sequences (7); the method comprising the following steps:

(a) the step of initializing a variable T (34) at -1, the step of initializing a variable D (35) at 0,

(b) the step of calculating, for each said reference index (10) of the reference set (30), the comparison distance (29) between the reference index (10) of the reference set (30) and the current index (14); in such a way that if the comparison distance (29) is less than a predetermined threshold SD (59), the variable D (35) is

increased by one; the condition being hereinafter called the condition for detecting said reference indexes (10);

the method being such that the moment when the first said reference index (10) of the reference set (30) of the specific audiovisual sequence (2) meets the detection condition is hereinafter called the moment of the first detection;

the method additionally comprises the following steps:

(c) the step of assigning to the variable T (34) the time elapsed since the moment of the first detection if the variable D (35) is different from zero,

(d) the step of repeating step (b) until the variable D (35) reaches the predetermined threshold SD (59); or of repeating step (a) if the variable T (34) exceeds a predetermined threshold ST (60),

(e) the step of detecting the specific audiovisual sequence (2) if the variable D (35) reaches the predetermined threshold SD (59).

8. System for identifying a specific image (11) and/or a specific audiovisual sequence (2) within any said flow (3) of said images (6) or said audiovisual sequences (7), and in particular with the prospect of being able to identify a proprietary image (4) within the flow (3) and/or of being able to identify, preferably in real time, a plurality of said proprietary audiovisual sequences (5) within the flow (3);

the system comprising:

said first calculation means (38) for calculating a reference index (10) for the specific image (11), using a indexing process (39), or

said first computer analysis means (40) for extracting said reference indexes (10) from the specific audiovisual sequence (2), so as to form a reference set (30) of said reference indexes (10);

the reference index (10) appearing in the form of a ordered and finite set (21a) of said values (20a), and in particular in the form of a characteristic vector (9a), encoding the content of the specific image (11);

in such a way that a reference index (10) characteristic of the specific image (11) and/or of the specific audiovisual sequence (2) is thus obtained;

the system additionally comprising:

said reception means (41) for receiving the flow (3) of said images (6) or said audiovisual sequences (7) comprising at least one said specific image (11) and/or at least one said specific audiovisual sequence (2),

said computer processing means (42) for digitizing the flow (3) of said images (6) or said audiovisual sequences (7);

the system additionally comprising:

said second calculation means (43) for calculating a current index (14) for said current images (13) of the flow (3), using the indexing process (39) for the current images (13) of the flow (3);

the current index (14) appearing in the form of a ordered and finite set (21b) of values, and in particular in the form of a characteristic vector (9b), encoding the content of the current image (13);

the system additionally comprising:

said comparison means (44) for comparing the reference index (10) of the specific image (11) with the current index (14) of the current image (13) of the monitored flow (3);

in such a way that the system makes it possible to detect a specific image (11) within a flow (3) with great precision and extremely fast, while being robust during major photometric alterations.

9. System in accordance with claim 8; the system being such that the first calculation means (38) for calculating a reference index (10) of a specific image (11) comprise:

said sampling means (45) for resampling the specific image (11) as a resampled specific image with fixed dimensions in advance,

said means for discrete quantization (46) of the pixel values of the specific image (11) resampled in such a way that the specific image (11) resampled is represented by a matrix (19) of the pixel values (17), after discrete quantization;

said sequencing means (47) for arranging the pixel values (17) according to a predetermined running order of the positions (18) in the matrix (19), and in particular by concatenating the values of each line of the matrix (19) in the form of a characteristic vector (9a), so as to obtain the reference index (10);

the system additionally comprising, if the specific image (11) is a color image (6) comprising levels of colors, said conversion means (48) for converting the levels of colors of the specific image (11) to be resampled to levels of gray beforehand.

10. System in accordance with claim 9; the first calculation means (38) additionally comprising said reference processing means (49a) for calculating the discrete entropy of the distribution of the values of the reference index (10); the entropy being hereinafter called the reference marginal entropy (50a);

in such a way that the comparison time is optimized;

in such a way that this said reference marginal entropy value (50a) can thus be added to the reference index (10).

11. System in accordance with any of the claims 8 through 10; the system being such that the second calculation means (43) for calculating a current index (14) of a current image (13) comprise:

said sampling means (45) for resampling the current image (13) as a current image (13) with fixed dimensions in advance,

said means for discrete quantization (46) of the pixel values of the current image (13) in such a way that the resampled current image (13) is represented by a matrix (19) of the pixel values (17), after discrete quantization;

said sequencing means (47) for arranging the pixel values according to a predetermined running order of the positions (18) in the matrix (19), and in particular by concatenating the values of each line of the matrix (19) in the form of a characteristic vector (9b), so as to obtain the current index (14);

the system additionally comprising, if the current image (13) is a color image (6) comprising levels of colors, said conversion means (48) for converting the levels of colors of the current image (13) to be resampled to levels of gray beforehand.

12. System in accordance with claim 11; the second calculation means (43) additionally comprising said current processing means (49b) for calculating the discrete entropy of the distribution of the values of the current index (14); the entropy being hereinafter called the current marginal entropy (50b);

in such a way that the comparison time is thus optimized;

in such a way that this current entropy value can thus be added to the current index (14).

13. System in accordance with claim 12; the reference indexes (10) and the current indexes (14) appearing in the form of said ordered and finite sets (21a, 21b) of values identified, in the reference index (10) and the current index (14), by a system of coordinates (22);

the system being such that it additionally comprises said third calculation means (52) for:

defining, for a given coordinate (24) of the system of coordinates (22), a pair of said values (25, 26), of which the first value (25) is the value appearing in the reference index (10) associated with the given coordinate (24), and of which the second value (26) is the value appearing in the current index (14) associated with the given coordinate (24),

calculating the bidimensional histogram (27) of the pairs of values (25, 26) obtained for all the coordinates of the system of coordinates (22) of the reference index (10) and the current index (14),

calculating the discrete entropy of the bidimensional histogram, hereinafter called the entropy of the bidimensional histogram (28),

calculating a comparison distance (29) between a reference index (10) and a current index (14), forming the ratio between the sum of the reference marginal entropy (50a) and of the current marginal entropy (50b) reduced by the entropy of the bidimensional histogram (28) as the numerator and the sum of the reference marginal entropy (50a) and the current marginal entropy (50b) as the denominator.

14. System in accordance with claim 13; the system being such that, to extract the reference indexes (10) of said specific audiovisual sequence (2) from the specific audiovisual sequence (2), made up of said specific images (11), it additionally comprises said fourth calculation means (53) using a calculation algorithm (54) comprising a step of initializing a reference set (30) containing the reference indexes (10) of the specific images (11) with the reference index (100) of the first specific image (110) of the specific audiovisual sequence (2); the reference index (100) of the first specific image (110) of the specific audiovisual sequence (2) constituting the first reference index of the reference set (30);

the calculation algorithm (54) additionally comprising:

(a) the step of calculating, for each said specific image (11) of the specific audiovisual sequence (2), a temporary current index (31) and of calculating a comparison distance (29) between the temporary current index (31) and the last reference index (32) added to the reference set (30);

(b) the step of comparing the comparison distance (29) between the temporary current index (31) and the last reference index (32) added to the reference set (30) to a predetermined threshold SE (33);

(c) the step of adding the temporary current index (31) to the reference set (30), if the comparison distance (29) exceeds the predetermined threshold SE (33); the temporary current index (31) becoming the last reference index (32) of the reference set (30);

the calculation algorithm (54) additionally comprising the step of repeating the steps (a) through (c) up to the end of the specific audiovisual sequence (2).

15. System in accordance with any of the claims 13 or 14; the system being such that the third calculation means (52) compare the comparison distance (29) between the reference indexes (10) and the current index (14) of the current image (13) of the monitored flow (3) to a predetermined threshold SF (65);

in such a way that in the case of any said flow (3) of said images (6), the specific image (11) is detected provided that the comparison distance (29) between the reference index (10) of the specific image (11) and the current index (14) is less than the predetermined threshold SF (65).

16. System in accordance with claim 14; the system being more particularly designed for detecting a specific audiovisual sequence (2) within any said flow (3) of said audiovisual sequences (7);

the system comprising said initialization means (57) for loading:

the value -1 in a first register T (55), and

the value 0 in a second register D (56);

the system additionally comprising said fifth calculation means (58) for calculating, for each said reference index (10) of the reference set (30), the comparison distance (29) between the reference index (10) of the reference set (30) and the current index (14); in such a way that if the comparison distance (29) is less than a predetermined threshold SD (59), the second register D (56) is increased by one; the condition being hereinafter called the condition for detecting said reference indexes (10);

the system being such that the moment when the first reference index (10) of the reference set (30) of the specific audiovisual sequence (2) meets the detection condition is hereinafter called the moment of the first detection;

the fifth calculation means (58) being equipped for loading in the first register T (55) the time elapsed since the moment of the first detection if the value stored in the second register D (56) is different from zero;

the fifth calculation means (58) being equipped for repeating the calculation of the comparison distance (29), until the value stored in the second register D (56) reaches the predetermined threshold SD (59), or for repeating the use of the initialization means (57) if the value stored in the first register T (55) exceeds a predetermined threshold ST (60),

in such a way that the specific audiovisual sequence (2) is detected if the value stored in the second register D (56) reaches the predetermined threshold SD (59).